Both the public and onsite worker exposure to ionizing radiation and hazardous chemicals and the resultant increase in cancer fatality risk to public and occupational health and safety are assessed for normal operations and accident conditions. The analysis of radiation impacts includes consideration of National Emission Standards for Hazardous Air Pollutants (NESHAPs). The widely used algorithms for estimating the risk of latent cancers from radiation are based on high dose rates, and impacts are then extrapolated to low rates by presumed linear response models. These models are known to overestimate the risk for low dose rates. For the purposes of presentation in the PEIS, the impacts calculated from the linear model are treated as an upper bound case, consistent with the widely used methodologies for quantifying radiogenic health impacts. This does not imply that health effects are expected. Moreover, in cases where the upper bound estimates predict a number of latent cancer deaths that is greater that 1, this does not imply that the latent cancer death(s) are identifiable to any individual.

The additional wastes generated by each alternative are compared to existing and planned treatment, storage, and disposal capacities for potential impacts to waste management. Waste management assumptions are based on current site practices and are contingent upon decisions to be made following completion of the *Final Waste Management Programmatic Environmental Impact Statement for Managing Treatment, Storage, and Disposal of Radioactive and Hazardous Waste* (DOE/EIS-0200).

The increased number of potential fatalities from truck accidents during the transportation of weapons-usable fissile materials among the various DOE sites and proposed facilities is evaluated for intersite transportation. Environmental justice addresses the potential for disproportionately high and adverse impacts to minority and low-income populations within 80 km (50 mi) of the sites.

The Storage and Disposition PEIS analyzes six candidate sites for the long-term storage of weapons-usable fissile materials. These sites are Hanford, NTS, INEL, Pantex, ORR, and SRS. These same sites were also used to evaluate the construction and operation of various facilities required for the disposition alternatives. These facilities include the pit disassembly/conversion and the Pu conversion facilities common to all disposition alternatives, the MOX fuel fabrication facility common to all reactor alternatives, the ceramic immobilization facility for the deep borehole alternative, the glass vitrification and ceramic immobilization facilities, and the Evolutionary LWR Alternative.

Other sites analyzed for Pu disposition are the ANL-W site at INEL for the Electrometallurgical Treatment Alternative and the Bellefonte Nuclear Plant for the Partially Completed LWR Alternative. These sites are used for analysis only and do not represent a DOE proposal or preference. Alternative sites may be analyzed in subsequent NEPA documents. A generic borehole site is evaluated for the alternatives in the Deep Borehole Category.[17] The Existing LWR Alternative analysis uses generic operating characteristics developed from 12 operating LWRs within the United States, and impacts are assessed using a generic site that was developed based on a composite of existing sites.

S.6 PREFERRED ALTERNATIVE SUMMARY OF IMPACTS

This section summarizes the maximum site impacts that would result at Hanford, INEL, Pantex, and SRS from combining the Preferred Alternative for storage with the Preferred Alternative for disposition at each of these sites. The Preferred Alternative identifies these sites as possible locations for all or some Pu disposition activities. The siting, construction, and operation of disposition facilities and variants would be covered in future tiered NEPA analyses. To the extent practical, DOE would use modified existing buildings and facilities for portions of the disposition activities. The use of existing buildings would reduce the environmental impacts and resource usages identified in this section.

[17] If either Borehole Alternative were selected, DOE would prepare a siting study and tiered NEPA documentation to identify and assess impacts of potential alternative borehole sites. DOE would analyze and compare existing and new buildings and facilities for the technologies chosen as part of the Preferred Alternative in subsequent, tiered NEPA review.

The preferred strategy for disposition is a combination of alternatives which includes operating existing reactors with MOX fuel and immobilization of some of the surplus Pu. The impacts from the operation of most of the existing domestic LWRs would not affect DOE sites. For purposes of analysis, approximately 70 percent of the surplus Pu, which is high purity material, could be readily converted into MOX fuel for use in nuclear reactors. The Preferred Alternative is to use existing reactors. DOE would retain using CANDU reactors in the event of a multilateral agreement among Russia, Canada, and the United States. For purposes of analysis, approximately 30 percent (low purity Pu) would be immobilized in glass or ceramic forms although much of it could be purified with chemical processing and used as MOX fuel in reactors. Disposition by use in reactors would require the construction of a MOX fuel fabrication facility and a pit disassembly/conversion facility at DOE sites. Disposition by immobilization would require the construction of a Pu conversion facility and an immobilization facility (either ceramic immobilization or vitrification) at a DOE site. Four DOE sites (Hanford, INEL, Pantex, and SRS) would be potential locations for MOX fuel fabrication and pit disassembly/conversion facilities, and two sites (Hanford and SRS) for the Pu conversion and immobilization facilities.

The following sections describe the total life cycle impacts that would result from the implementation of the Preferred Alternative at the DOE sites identified for potential placement of the disposition facilities. The analysis conservatively assumed a maximum impact scenario where two or four new disposition facilities could be built at the same DOE site. For immobilization, the analysis conservatively uses impacts from the ceramic immobilization facility since they are generally larger than the impacts from the vitrification facility. If existing facilities (such as the DWPF at SRS and the FMEF at Hanford) were used for some of the disposition activities, the impacts would be reduced.

Land Resources

Collocating disposition facilities at Hanford, INEL, Pantex, or SRS would likely minimize land-use impacts due to the sharing of land resources. In addition, optimal use of existing buildings and facilities would occur where possible. All four sites would have adequate land area to accommodate the facilities. Most disposition facilities would be separated from the site boundary by a 1.6-km (1-mi) buffer zone. For all four DOE sites, construction and operation would not affect other onsite or offsite land uses. No prime farmlands exist onsite. Construction and operation would be compatible with site, State, and local land-use plans, policies, and controls. This section describes the impacts to land resources from constructing and operating the Preferred Alternative storage and disposition facilities for each site.

Hanford Site. Plutonium materials would continue to be stored at the Plutonium Finishing Plant (PFP) in the 200 West Area, pending decisions on their disposition. The potential pit disassembly/conversion, Pu conversion, ceramic immobilization, and MOX facilities would be located on vacant land in the 200 Area adjacent to 200 East. The total area disturbed during construction would be approximately 191 hectares (ha) (472 acres); operation would require approximately 133 ha (329 acres). Construction and operation of the facilities would conform to existing and future land use plans as described in the current *Hanford Site Development Plan* and ongoing discussions in the comprehensive land-use planning process.

Construction and operation of these facilities would also be consistent with the industrialized landscape character of the 200 Area and with the current Visual Resource Management (VRM) Class 5 designation. The ceramic immobilization facility or MOX facility could have stack plumes that could be visible from public viewpoints with high sensitivity levels, including State Highways 24 and 240 and the city of Richland; however, the proposal would be compatible with the existing industrial character of the Hanford area.

Idaho National Engineering Laboratory. Plutonium materials would continue to be stored at the Idaho Chemical Processing Plant (ICPP) and at ANL-W in the Zero Power Physics Reactor (ZPPR) and Fuel Manufacturing Facility (FMF) vaults, pending decisions on their disposition. The potential pit disassembly/conversion and MOX facilities would be located on undeveloped land within or near the ICPP security area. The total area disturbed during construction would be approximately 135 ha (334 acres);

operation would require approximately 93 ha (230 acres). Construction and operation would be consistent with the *Idaho National Engineering Laboratory Site Development Plan*, which designates the ICPP as situated within the Central Core Area/Prime Development Zone at INEL.

Construction and operation of these facilities would also be consistent with the industrialized landscape character of the ICPP and with the current VRM Class 5 designation. The MOX facility may have stack plumes that could be visible from off-site public viewpoints; however, the proposal would be compatible with the existing industrial character of the area.

Pantex Plant. Buildings 12-66 and 12-82 in Zone 12 South would be modified to accommodate the long-term storage of Pantex pits and RFETS pits under the Preferred Alternative. Construction and operation would require less than 1 ha (2.5 acres) and conform with the current *Pantex Site Development Plan*, which includes as part of its master plan the Fissile Material Storage Facility in Zone 12. Zone 12 is also the potential location for the pit disassembly/conversion facility. Construction and operation would require less than 14 ha (35 acres) and conform with the Pantex Site Development Plan, which designates Zone 12 for weapon assembly/disassembly. The total area disturbed during construction would be approximately 135 ha (334 acres); operation would require approximately 93 ha (230 acres). When completed, the potential MOX fuel fabrication facility would be located on previously undeveloped land in Zone 11, which is currently designated for applied technology. However, Pantex could revise the site development plan to accommodate the potential MOX facility.

The existing Zone 12 VRM Class 5 designation would not change due to the Preferred Alternative. The MOX facility in Zone 11 may have stack plumes that could be visible from off-site viewpoints; however, the proposal would be compatible with the existing site industrial character of the area.

Savannah River Site. The APSF in F-Area would be modified to accommodate the long-term storage of SRS non-pit Pu material and RFETS non-pit Pu material for the Preferred Alternative. Approximately 191 ha (472 acres) of vacant land in the F-Area would be disturbed during construction of the pit disassembly/conversion, Pu conversion, MOX fuel fabrication, and ceramic immobilization facilities. The completed facilities would occupy approximately 133 ha (329 acres). Construction and operation would conform with existing and future land use as designated by the current *Savannah River Site Development Plan*. According to the Plan, current F-Area land use is designated industrial operations, while the future land-use category is primary industrial mission. Although the proposal would convert undeveloped land, forested land, and a very small portion of National Environmental Research Park lands, the action would conform with site land-use plans.

Construction and operation of the upgrade storage, pit disassembly/conversion, Pu conversion, and ceramic immobilization facilities would be consistent with the industrial landscape character and current VRM Class 5 designation of the F-Area. Construction and operation of the MOX facility would change the current VRM Class 4 designation of the proposed site north of the P-Reactor Area to Class 5. The ceramic immobilization and MOX facilities may have stack plumes; however, because of hilly terrain, visual effects to public access roads with high sensitivity levels would not be apparent.

Site Infrastructure

The resource requirements for the construction of the proposed facilities are not expected to exceed site capabilities for any of the sites evaluated. At Hanford, the planned facilities use natural gas as the primary utility fuel, and the total requirement for natural gas (13,609,000 cubic meters [m^3]/yr [17,800,000 cubic yds {yd^3}/yr]) would be larger than currently available. Since INEL and SRS use fuel oil as the primary utility fuel, use of natural gas in lieu of fuel oil would require additional infrastructure. Final designs for facilities under the Preferred Alternative at INEL and SRS would be adapted to use fuel oil. At SRS the oil requirement would exceed the site availability by 277,750 liters (l)/yr (73,370 gallons [gal]/yr). Additional oil

and natural gas requirements could be met by increasing procurement at all sites. Locating the Preferred Alternative disposition actions at any of the analyzed sites would require the construction of additional onsite roads and rail spurs.

Air Quality and Noise

Construction and operation of the proposed facilities under the Preferred Alternative would generate criteria and toxic/hazardous air pollutants. To evaluate air quality impacts at Hanford, INEL, Pantex, and SRS, potential concentrations from the facilities have been compared to Federal and State guidelines.

Concentrations of particulate matter less than or equal to 10 microns in diameter (PM_{10}) and total suspended particulates (TSP) are expected to increase during construction of the facilities. Simultaneous construction of the facilities could result in elevated levels of these pollutants. However, appropriate control measures would be implemented to maintain fugitive emissions within applicable Federal and State ambient air quality standards during construction.

The Prevention of Significant Deterioration (PSD) regulations, which are designed to protect ambient air quality in attainment areas, apply to new sources and major modifications to existing sources. Based on estimated emission rates, PSD permits may be required at all of the sites under consideration for the Preferred Alternative facilities. PSD permits may require inclusion of "offsets" (reductions of existing emissions) for any additional or new emission source.

Noise sources associated with the Preferred Alternative facilities may include construction equipment, increased traffic, ventilation equipment, cooling systems, and emergency diesel generators. The contribution to offsite noise levels would continue to be small at all of the sites because the facilities associated with the Preferred Alternative would be a sufficient distance away from the site boundary and sensitive receptors. Due to the large size of the sites, noise emissions from construction and operation activities would not be expected to cause annoyance to the public.

Water Resources

The construction and operation of the proposed facilities under the Preferred Alternative at Hanford, INEL, Pantex, and SRS would affect water resources. All facilities would be constructed outside of the 100-year, 500-year, and probable maximum flood; although the 500-year floodplain is not completely mapped at SRS, the facilities would likely be located outside the 500-year floodplain. Flooding from dam failures and flooding from a landslide resulting in river blockage would only be potentially possible at Hanford or INEL, but are not expected to occur. Wastewater discharges at all sites are expected to continue to meet National Pollutant Discharge Elimination System (NPDES) limits and reporting requirements at all sites.

Hanford Site. Surface water obtained from the Columbia River would be used as the water source for operation of the proposed facilities. The total water requirement for the Preferred Alternative at Hanford would be less than 1 percent of the Columbia River's average annual flow (3,360 m^3/s [118,700 ft^3/s]). The withdrawals are negligible in comparison with the average flow of the river and would not noticeably affect the local or regional water supply.

The wastewater discharge would account for a 98-percent increase over the No Action Alternative projected discharge. The wastewater would be treated in newly constructed sanitary, utility, and process wastewater treatment systems prior to disposal.

Idaho National Engineering Laboratory. Water requirements for the operation of the Preferred Alternative at INEL would be obtained from groundwater sources. The water requirements for the site over the projected No

Action Alternative water usage would be less than a 0.05-percent increase for construction (approximately 0.24 percent of the groundwater allotment) and a 2-percent increase for operations (approximately 9.6 percent of the groundwater allotment).

The wastewater discharged during operations would represent a 24-percent increase over the projected No Action Alternative discharge. Existing INEL treatment facilities could accommodate all the new Preferred Alternative processes and wastewater streams. If necessary, new sanitary, utility, and process wastewater treatment systems would be constructed to accommodate the increase.

Pantex Plant. Water requirements for the operation of technologies identified in the Preferred Alternative for Pantex would be obtained from groundwater resources or, if feasible, from the City of Amarillo Hollywood Road Wastewater Treatment Plant. Should only groundwater be used, the total annual site groundwater withdrawal, including that required for the Preferred Alternative in the year 2005 (the No Action base year), would be 428 million l/yr (113 million gal/yr). This represents a 72-percent increase in the projected No Action Alternative water usage. Because the projected No Action Alternative water usage reflects reductions in water use due to planned downsizing over the next few years, this quantity (No Action plus the Preferred Alternative) is considerably less than what is currently being withdrawn at Pantex (836 million l/yr [221 million gal/yr]). Pantex's groundwater usage would still contribute to the overall declining water levels of the Ogallala Aquifer.

Total estimated wastewater discharge for the Preferred Alternative (283 million l/yr [74.8 million gal/yr]) at Pantex would result in a 100-percent increase in the projected No Action Alternative discharge. If necessary, new sanitary, utility, and process wastewater treatment systems would be constructed to accommodate the increase.

Savannah River Site. Water requirements during operation of the Preferred Alternative would be obtained from existing or new well fields at SRS. The Preferred Alternative water requirements for the site would be a 3.7-percent increase over projected No Action Alternative groundwater usage. Suitable groundwater from the deep aquifers at the site is abundant, and aquifer depletion is not a problem.

The Preferred Alternative wastewater discharge to the river would be less than 5 percent of the minimum flow of Fourmile Branch (0.16 m^3/s [5.7 ft^3/s]), and less than 0.003 percent of the Savannah River average flow (283 m^3/s [9,990 ft^3/s]). SRS treatment facilities could accommodate all the new processes and wastewater streams if a new facility is built for tritium supply and recycling operations as planned. If necessary, new sanitary, utility, and process wastewater treatment systems would be constructed to accommodate the increase.

Geology and Soils

The construction of the potential facilities under the Preferred Alternative would involve some ground disturbing activities at Hanford, INEL, Pantex, and SRS (see discussion under Land Resources). Ground disturbance increases the potential for soil erosion. The key factors affecting the erosion potential of a site are the amount of disturbed land and the amount of annual precipitation. The potential for soil erosion at Hanford, INEL, and Pantex is slight because of low precipitation. Since SRS receives more precipitation, the potential for erosion is considered moderate. The amount of soil loss would depend on factors such as the frequency and severity of precipitation events; wind velocities; and the area, location, and duration of soil disturbance.

During operation, improvements to buildings, roads, and landscaping would considerably reduce the erosion potential. Erosion from stormwater runoff and wind could occasionally occur during operation of the facilities. Beyond increased erosion potential, no direct or indirect effects on geologic resources are anticipated.

Biological Resources

Hanford Site. Plutonium materials would continue to be stored at the PFP in the 200 West Area. Construction of the pit disassembly/conversion, Pu conversion, ceramic immobilization, and MOX facilities would be located on vacant land in the 200 Area adjacent to 200 East and would affect animal populations. Less mobile animals within the project area, such as reptiles and small mammals, would not be expected to survive. Noise from construction and operation activities would cause larger mammals and birds in the construction area and adjacent areas to move to similar habitat nearby. Nests and young animals living within the assumed sites may not survive. The sites would be surveyed as necessary for the nests of migratory birds before construction. Areas disturbed by construction, but not occupied by facility structures, would be of minimal value to wildlife because they would be maintained as landscaped areas.

Wetlands or aquatic resources would not be affected since no wetlands or surface water bodies exist near the assumed facilities locations. During both construction and operation, water would be withdrawn from the Columbia River through an existing intake structure, and wastewater would be discharged to evaporation/infiltration ponds. Wetlands or aquatic resources bordering the river would not be affected because the volume of water required represents a small percentage of the flow of the river.

It is unlikely that federally listed threatened and endangered species would be affected by construction and operation of the four disposition facilities, but sagebrush habitat would be disturbed. The sagebrush community is an important nesting/breeding and foraging habitat for several State-listed and candidate species, such as the ferruginous hawk, loggerhead shrike, western burrowing owl, pygmy rabbit, western sage grouse, and sage thrasher. Pre-activity surveys would be conducted as appropriate before construction to determine the occurrence of plant species or animal species and habitat in the area to be disturbed. DOE would also consult with Federal and State agencies pursuant to the *Endangered Species Act* (ESA) and other statutes as appropriate.

Idaho National Engineering Laboratory. Plutonium materials would continue to be stored at the ICPP and at ANL-W in the ZPPR and FMF vaults. Construction of the pit disassembly/conversion and MOX facilities on undeveloped land within or near the ICPP security area would affect animal populations. Less mobile animals within the project area, such as reptiles and small mammals, would be expected not to survive. Noise from construction and operation activities would cause larger mammals and birds in the construction area and adjacent areas to move to similar habitat nearby. Nests and young animals living with the assumed sites may not survive. The sites would be surveyed as necessary for the nests of migratory birds before construction. Areas disturbed by construction, but not occupied by facility structures, would be of minimal value to wildlife because they would be maintained as landscaped areas.

Wetlands and aquatic resources associated with the nearest surface water body, the Big Lost River, are located 1.6 km (1 mi) from the facility location. Due to the lack of wetlands or aquatic resources at the assumed facility locations, these resources would not be affected by construction or operation of the two facilities.

It is unlikely that federally threatened or endangered species would be affected by construction of the two disposition facilities, but several State-listed species may be affected. Burrows and foraging habitat for the pygmy rabbit would be lost. Bat species such as the Townsend's western big-eared bat may roost in caves and forage through the assumed site. One State-listed sensitive plant species could potentially be affected by construction of the facility. The plant species, tree-like oxytheca, has been collected at eight sites on INEL and at only two other sites in Idaho. If present, individual plants of this species could be destroyed during land clearing activities. Preactivity surveys would be conducted as appropriate before construction to determine the occurrence of these species and habitat in the area to be disturbed. DOE would also consult with Federal and State agencies pursuant to the ESA and other statutes as appropriate. No impacts to threatened and endangered species are expected due to facility operation.

Pantex Plant. Upgrading the existing storage Pu storage facility at Pantex would cause minimal disturbance to biological resources because all activities, including some new construction, would take place within the developed area. Noise associated with construction could cause some temporary disturbance to wildlife, but this impact would be minimal since animals living adjacent to the developed area have already adapted to its presence. Impacts to wetlands and aquatic resources would not occur since these resources do not exist in the upgrade area. Since the upgrade would take place within a developed area, impacts to threatened and endangered species would not be expected.

Both the pit disassembly/conversion facility location in Zone 12 and the MOX fuel fabrication facility location in Zone 11 lack natural vegetation. Disturbance of wildlife would be limited due to the existing disturbed nature of the assumed locations; however, small mammals and some birds and reptiles could be displaced by construction. Since the area around both locations does not contain any wetlands or aquatic resources, these resources would not be affected by construction of the facility. During operation, wastewater would be discharged to site playas through NPDES-regulated outfalls. The additional wastewater could lead to minor increases in open water near the outfalls, as well as changes in plant species composition. It is unlikely that federally listed threatened or endangered species would be affected by construction or operation of the facilities. Although the assumed sites have been disturbed, it is possible that the State-listed Texas horned lizard could be present. Before construction, preactivity surveys would be conducted, as appropriate to determine the presence of any special status species and habitat on the proposed site; DOE would also consult with Federal and State agencies pursuant to the ESA and other statutes as appropriate.

Savannah River Site. No additional impacts on biological resources are expected from modifying the APSF in F-Area to accommodate the storage of RFETS non-pit Pu material in addition to SRS non-pit Pu material because the modification would only use previously disturbed land.

For the pit disassembly/conversion, Pu conversion, and ceramic immobilization facilities, impacts to terrestrial resources would be minimal because the F-Area is one of the highly developed industrial areas of the SRS. Noise associated with construction could cause some temporary disturbance to wildlife, but this impact would be minimal since animals living adjacent to the F-Area have already adapted to similar disturbances. There would be no direct impacts to wetlands or aquatic resources from construction of the facility. Secondary impacts from stormwater runoff would be controlled by implementation of a soil erosion and sediment control plan. Operational impacts to wetlands and aquatic resources would be minimal since there would be relatively small increases in treated wastewater and storm water that would be discharged via NPDES-permitted outflows. Impacts from construction and operation of the three disposition facilities would not be expected to affect threatened and endangered species due to the developed nature of the assumed facility locations. Although suitable foraging habitat for the red-cockaded woodpecker exists in the area, the woodpecker colonies are located far enough from the facilities so that this species would not be directly affected by these facilities. Before committing construction resources, DOE would consult with Federal and State agencies pursuant to the ESA and other statutes as appropriate.

Construction of the MOX facility north of the P-Reactor Area on the east side of SRS Route F would affect animal populations. Less mobile animals within the project area, such as reptiles and small mammals, would not be expected to survive. Noise from construction and operation activities would cause larger mammals and birds in the construction area and adjacent areas to move to similar habitat nearby. Nests and young animals living with the assumed sites may not survive. The sites would be surveyed as necessary for the nests of migratory birds before construction. Areas disturbed by construction, but not occupied by facility structures, would be of minimal value to wildlife because they would be maintained as landscaped areas.

Since the majority of the assumed MOX fuel fabrication facility site is upland, the facility could be located to avoid direct impacts to wetlands. Wastewater discharge from construction and operation would be minimal and would not be expected to affect wetlands associated with the receiving stream. Stormwater runoff during construction could cause temporary water quality changes in local tributaries to Par Pond. During operation,

nonhazardous wastewater flow increases are not expected to impact stream hydrology or aquatic resources. All discharges would be required to meet NPDES permit regulations.

It is unlikely that federally listed threatened or endangered species would be affected by construction or operation of a MOX fuel fabrication facility. Although bald eagles have been sighted in the vicinity of the assumed facility location, it is highly unlikely that construction and operation of the MOX fuel fabrication facility would affect this species. Although suitable foraging habitat for the red-cockaded woodpecker exists in the area, the woodpecker colonies are located far enough from the facilities so that this species would not be directly affected by the MOX facility. Before construction, preactivity surveys would be conducted as appropriate to determine the presence of any special status species and habitat on the proposed site; DOE would consult with Federal and State agencies pursuant to the ESA and other statutes as appropriate.

Cultural and Paleontological Resources

The impacts to cultural and paleontological resources are closely related to the amount of land disturbed. The land-use impacts associated with construction and operation of the Preferred Alternative actions at Hanford, INEL, Pantex, and SRS are discussed under Land Resources. Because most of the locations proposed have been previously disturbed, it is unlikely that they would contain subsurface prehistoric or historic archaeological deposits. Some paleontological remains may be encountered during construction. Operations would not have additional impacts on historic, prehistoric, or paleontological resources, but there may be visual or auditory intrusions to Native American resources.

Hanford Site. Plutonium materials would continue to be stored at the PFP in the 200 West Area. The pit disassembly/conversion, Pu conversion, ceramic immobilization, and MOX facilities would be located on vacant land in the 200 Area adjacent to 200 East. Although no archeological resources have been identified during surveys conducted in the adjacent 200 Areas, some may exist in the facility locations. Any such sites would be identified through compliance with Sections 106 and 110 of the *National Historic Preservation Act* of 1966 (NHPA). Any identified sites may be affected by facility construction. Operation would not result in additional impacts.

Although all of Hanford is considered sacred land by some Native American groups, no areas of great cultural significance have been identified close to the 200 Area. Resources may be identified through facility-specific consultation. Impacts from construction and operation may include reduced access to traditional use areas or visual or auditory intrusion into sacred or ceremonial space.

Pliocene and Pleistocene fossil remains have been discovered at Hanford. Although none have been recorded in the facility locations, they may exist. These resources may be affected by ground disturbing construction. Operations would not have additional impacts on paleontological resources.

Idaho National Engineering Laboratory. Plutonium materials would continue to be stored at the ICPP and the ZPPR and FMF vaults in ANL-W. The pit disassembly/conversion and MOX facilities would be located on undeveloped land within or near the ICPP security area. The pit disassembly/conversion facility would be sited in a location previously approved for the construction of the Special Isotope Separation Project. A surface survey of this area identified no prehistoric or historic sites. Although it is possible, the ICPP is unlikely to contain intact subsurface cultural deposits, due to prior ground disturbance and environmental setting. INEL has a contingency plan in place should any archeological remains be discovered during construction. Two historic sites exist adjacent to the ICPP, one historic can scatter lies across the Big Lost River to the northeast, and one abandoned homestead is to the east. The can scatter is not considered eligible for National Register of Historic Places (NRHP) listing, and the homestead has been fenced off for protection. Construction and operation are not expected to affect either site.

Native American resources may be affected by the proposed facilities. Facility construction and operation may have visual or auditory impacts on traditional use areas or sacred sites. Resources may be identified through consultation with the interested tribes.

Some paleontological remains may be encountered during construction. The ICPP lies on alluvial gravels associated with the Big Lost River floodplain, which have produced fossilized remains. Operation would not have an effect on paleontological resources.

Pantex Plant. Modifications of Buildings 12-66 and 12-82 in Zone 12 South to accommodate the long-term storage of Pantex pits and RFETS pits are not considered NRHP eligible based on an evaluation of World War II Era structures at Pantex. However determinations of NRHP-eligible Cold War Era structures have not been completed, and some structures in Zone 12 may be determined eligible on that basis. Zone 12 is also the potential location for the pit disassembly/conversion facility. Because Zone 12 South is developed, disturbed, and removed from water sources, it is unlikely to contain subsurface prehistoric or historic archeological deposits, even on lands used for equipment laydown or construction parking. No impacts to prehistoric or historic resources are expected to result from the construction or operation of these facilities.

Areas that would be disturbed in Zone 11 for the MOX fuel fabrication facility have not been systemically surveyed for archaeological or paleontological resources. Before construction, additional survey work may be necessary under Section 106 of the NHPA. Because Zone 11 is disturbed, it is unlikely to contain subsurface prehistoric or historic archeological deposits. Should any subsurface remains be discovered during construction, appropriate mitigation, documentation, and/or preservation measures would be conducted as necessary. Operations would not have additional impacts to archeological resources as it does not result in additional ground disturbance. Facility construction may have an impact on historic structures at Pantex. The original buildings in Zone 11 were constructed between 1942 and 1945 to produce general purpose bombs. Zone 11 contains buildings, ramps, and landscape features that clearly illustrate the historic layout of a World War II bomb manufacturing line. Only two buildings within Zone 11 have been determined ineligible for listing on the NRHP. Construction may obscure the spatial relationship between these buildings, thereby compromising their historic significance. Operation of the facility is not expected to affect historic structures.

The Department has recently initiated consultation with Native American groups that have expressed interest in Pantex lands. To date, no Native American resources have been identified within Zones 11 and 12. Resources may be identified through additional consultation. Although no mortuary remains have been discovered at Pantex to date, it is possible that some exist within land to be disturbed by development. Burials are considered important Native American resources. Construction and operation could affect traditionally used plant and animal species.

The surficial geology of the Pantex area consists of silts, clays, and sands of the Blackwater Draw Formation. In other areas of the High Plains, this formation has produced Late Pleistocene vertebrate remains including woolly mammoth, bison, and camel, sometimes in context with archaeological remains. The land to be disturbed during construction may contain some fossilized remains. Operation would not have an affect on paleontological resources.

Savannah River Site. The Actinide Packaging and Storage Facility in F-Area would be modified to accommodate the storage of SRS non-pit Pu material and RFETS non-pit Pu material for the storage Preferred Alternative. Vacant land in the F-Area would be used for the pit disassembly/conversion, Pu conversion, and ceramic immobilization facilities. Portions of the F-Area have been surveyed and contain sites potentially eligible for the NRHP. Additional surveys would be conducted in any unsurveyed areas to be disturbed by construction. Site types known to occur at SRS include remains of prehistoric base camps, quarries, and workshops. Historic resources include remains of farmsteads, cemeteries, churches, and schools. Resources such as these may be affected by new facility construction, but not operation.

The MOX fuel fabrication facility would be located on undeveloped land approximately 1.6 km (1 mi) north of the P-Reactor Area on the east side of SRS Route F. To date, seven prehistoric sites have been located within 0.5 km (0.3 mi) of this area, so the potential for archaeological sites is moderate to high, and some NRHP-eligible resources may occur within the acreages that would be disturbed by construction. Prehistoric site types that may occur at SRS include villages, base camps, limited activity sites, quarries, and workshops. Historic site types that may occur at SRS include farmsteads, tenant dwellings, mills, plantations and slave quarters, rice farming dikes, cattle pens, dams, towns, churches, cemeteries, trash scatters, and roads.

Some Native American resources may be affected by construction and operation of the facilities. Resources such as prehistoric sites, cemeteries, isolated burials, and traditional plants could be affected by construction. Facility operation could result in reduced access to traditional use areas or sacred space. Visual or auditory intrusions to the areas may also result from the proposed facilities. These resources would be identified through consultation with the potentially affected tribes.

Some paleontological remains may occur on this acreage, but impacts during construction would be considered negligible because fossil assemblages known to occur at SRS are of low research value. No additional impacts are expected to paleontological resources during operation since no additional ground disturbance is expected.

Socioeconomics

At Hanford, INEL, Pantex, and SRS the primary impact of the Preferred Alternative would be to increase regional employment and income. There would be some increase in demand for community services and housing at each of the sites as a result of in-migrating population. However, the available housing and existing community infrastructure would be able to accommodate these small population increases. Construction and operation of the proposed facilities would increase traffic flow and cause a potential decline in the level of service on some road segments at all sites except Hanford. At RFETS, phaseout of Pu storage would result in the loss of approximately 2,200 direct jobs. Compared to the total employment in the area, the loss of these jobs and the impacts to the regional economy would not be severe.

Hanford Site. Plutonium materials would continue to be stored at the PFP in the 200 West Area, and there would be no impact on the site workforce. Construction of the pit disassembly/conversion, Pu conversion, ceramic immobilization, and MOX facilities would continue through the year 2013, and there would be sufficient available labor within the region to fulfill construction workforce requirements. Economic impacts from construction would peak in 2010, during construction of the ceramic immobilization facility. Total regional economic area (REA) employment would increase by 2001 due to construction of the ceramic immobilization facility. However, during this same period, the other three disposition facilities would already be fully operational, generating approximately 7,500 additional jobs in the REA.

In the year 2003, the pit disassembly/conversion and MOX facilities would be the first disposition alternative facilities to become fully operational. Pu conversion would begin in 2006, and the ceramic immobilization operations would begin in 2013. The operational workforce would increase beginning in the year 2003 and peak in the year 2013 when all of the disposition facilities would become fully operational. Total direct employment would reach approximately 3,100 in 2013. Total REA employment would increase by approximately 10,400, and unemployment would decrease from 9.1 to 7.1 percent. The per capita income would increase by 2 percent.

In-migration to fulfill specialized direct job requirements would lead to a population increase of about 1 percent in the ROI. The additional population would increase the demand for community services by approximately 1 percent. Demand for housing would also increase, but the impact on the local markets would be minimal.

Construction and operation workers at Hanford would generate 1,920 and 5,900 additional vehicle trips per day on the local roads, respectively. The level of service would not change due to the additional traffic generated

during construction. Operations would cause a drop in level of service from B to C on Washington State Route 240 from Washington State Route 24 to Washington State Route 224.

Idaho National Engineering Laboratory. Plutonium materials would continue to be stored at ICPP and ZPPR, and in FMF vaults at ANL-W. No additional workforce would be required for continuation of the storage mission at INEL. Construction of the pit disassembly/conversion and MOX facilities would take place concurrently and continue through the year 2003. Some in-migration would take place both during construction and operation to fill specialized job requirements. Direct employment during peak construction would reach 660 in 1999 and total 1,330 during the first year of full operation in 2003. Total REA employment would increase by approximately 1,200 during construction and by approximately 6,000 during operations. Unemployment would decrease from 5.4 percent to 4.8 percent during peak construction and fall further to 2.4 percent during operation. The per capita income would increase by less than 0.4 percent during construction and by about 1.4 percent during operations.

In-migration to fulfill direct job requirements for both construction and operations would lead to a population increase of less than 1 percent in the ROI. The additional population would increase demand for community services by less than 1 percent during both construction and operations. Demand for housing would also increase, but, the impact on the local markets would be minimal.

Construction and operation workers at INEL would generate 1,267 and 2,554 additional vehicle trips per day on local roads, respectively. The level of service would not change due to additional traffic generated during construction. Operations would cause a drop in level of service from D to E on US 20 from US 26/91 at Idaho Falls to US 26 East. Operations would also cause a drop in level of service from B to C on US 20/26 from US 26 East to Idaho State Route 22/33.

Pantex Plant. Buildings 12-66 and 12-82 would be modified to accommodate the long-term storage of Pantex pits and RFETS pits for the storage Preferred Alternative. Additional workers would be required for construction and operation of the modified storage facilities. Construction of the pit disassembly/conversion and MOX fabrication facilities would take place concurrently and continue through 2003, when full operations would commence. Because the construction of the disposition facilities would require a larger workforce than would modification of the storage facilities, peak construction impacts would occur in 1999. Peak operation impacts would occur in 2005, when all three facilities would be fully operational. Total direct construction employment during peak construction would reach 660 in 1999, and direct operation employment would reach 1,420 in 2005, when all three facilities would be fully operational. Total REA employment would increase by 1,192 during peak construction and by 6,404 during operations. Unemployment would decrease from 4.8 percent to 4.3 percent during peak construction and fall further to 3.0 percent during operations. The per capita income would increase about 0.3 percent during construction and by 0.5 percent during operations.

In-migration to fulfill direct job requirements for both construction and operations would lead to a population increase of 0.1 percent during construction and about 2 percent during operation. The increase in demand for community services during construction and operation would be minimal. Demand for housing would also increase, but, the impact on the local markets would be minimal.

Construction and operation workers at Pantex would generate 1,267 and 2,726 additional vehicle trips per day on local roads, respectively. The level of service would not change due to additional traffic generated during construction. Operations would cause a drop in level of service from A to B on Farm-to-Market 683 from US 60 to Farm-to-Market 293 and on Farm-to-Market 2373 from I-40 to US 60.

Savannah River Site. Under the Preferred Alternative, the Actinide Packaging and Storage Facility in the F-area would be modified to accommodate the long-term storage of the SRS non-pit Pu material and RFETS non-pit Pu material. The modification activities would employ workers from the current workforce, while operation of the expanded storage facility would require some additional workers. Construction of the pit

disassembly/conversion, Pu conversion, MOX fuel fabrication, and the ceramic immobilization facilities would continue until 2013, when all of the facilities would become operational. There would be sufficient available labor in the region to fulfill the construction workforce requirements. Economic impacts from construction would peak in 2010, during construction of the ceramic immobilization facility. Total REA employment would increase by 1,793 due to construction of the ceramic immobilization facility. However, during this same period, the other three disposition facilities would already be operating and generating an additional 6,936 jobs in the REA. Peak economic impacts would occur in 2013, when all of the storage and disposition facilities would be fully operational. Total employment in the region would increase by 9,482, and unemployment would decrease to 4.5 percent. Regional per capita income would increase by about 1.6 percent.

Because of the demand for in-migrating workers to fill specialized employment requirements, the ROI population would increase by 0.9 percent. Demand for community services would increase about 1 percent or less. The increase in demand for housing would be too small to affect the market.

Construction and operation workers at SRS would generate 1,920 and 6,150 additional vehicle trips per day on local roads, respectively. Construction would cause a drop in level of service from E to F on South Carolina State Route 19 from US 1/78 at Aiken to US 278. Operations would not significantly impact local roads.

Public and Occupational Health and Safety

Normal Operations. The human health impacts from the radiological and hazardous chemical releases during facility normal operations associated with the storage and disposition Preferred Alternative actions were analyzed at each of the DOE sites. The impact of the Preferred Alternative actions were then combined to obtain the "total impact." Total impact for each receptor/impact parameter is the summation of each facility, action, process, or technology for each of the operational campaigns (the number of years required to complete Pu disposition). Under normal radiological operations, the annual incremental dose to the maximally exposed individual (MEI) ranges from 2.7×10^{-4} millirem (mrem)/yr at INEL to 4.1×10^{-3} mrem/yr at SRS. All doses, when added to No Action, are within the radiological limits specified in NESHAPS (40 CFR 61, Subpart H) and DOE Order 5400.5. The annual incremental dose to the population within 80 km (50 mi) from the Preferred Alternative ranges from 4.2×10^{-3} person-rem/yr at INEL to 0.22 person-rem/yr at SRS. For DOE activities, proposed 10 CFR 834 (See 58 FR 1628) would generally limit the potential annual population dose to 100 person-rem from all pathways combined, and would require an As Low As Reasonably Achievable Program. When the contribution from the Preferred Alternative is combined with the No Action population dose for each of the sites, the total dose is well within the proposed 10 CFR 834. The dose assessments of the involved worker for storage and disposition facilities are within DOE radiological limits and administrative control levels. The incremental latent cancer fatalities to the involved workforce statistically estimated from these doses attributed to the Preferred Alternative range from 0.48 at INEL to 1.32 at SRS for the entire campaign (estimates based on the *1990 Recommendations of the International Commission of Radiological Protection*).

Facility Accidents. A set of potential accidents was postulated for each component of the Preferred Alternative. For each DOE site subject to multiple storage and disposition actions (Hanford, INEL, Pantex, and SRS), this includes a set of accidents for the storage option coupled with the combination of preferred disposition technologies assumed for the analysis. For the Existing LWR Alternative, a Probabilistic Risk Assessment (PRA) approach was applied to determine the effects of operating an existing LWR with a MOX core. The incremental effects are described below.

One measure of impact calculated from modeled accident scenarios is expected risk, the summation of risk (the product of accident occurrence probability and consequence) for the accident spectrum modeled for each component of the Preferred Alternative. These expected risks were aggregated for the Preferred Alternative for the following impact receptors: a worker located 1,000 m (3,280 ft) from the accident release point; the maximum hypothetical offsite individual located at the site boundary; and the population located within 80 km

(50 mi) of the accident release point. Aggregated expected risk estimates of cancer fatality(s) for each assumed campaign under the Preferred Alternative range from: $1.3x10^{-6}$ at INEL to $1.5x10^{-5}$ at Pantex; $1.4x10^{-8}$ at INEL to $6.0x10^{-6}$ at Pantex; and $3.0x10^{-5}$ at INEL to $9.1x10^{-4}$ at Pantex; respectively for these impact receptors. The Y-12 upgrade at ORR under the Preferred Alternative could reduce the expected risk of cancer fatalities for the design basis accidents analyzed in the Y-12 EA to $5.1x10^{-7}$, $7.4x10^{-6}$, and $5.7x10^{-8}$ per year for the 80-km (50-mi) offsite population, MEI, and noninvolved worker, respectively by meeting the performance goal for a moderate hazard facility of Performance Category 3 as prescribed in DOE Order 5480.28, *Natural Phenomena Hazards Mitigation*.

The evaluated accident scenario with the highest risk to the public at the DOE sites under the Preferred Alternative (a fire on the loading dock of the MOX fuel fabrication facility) would result in an estimated risk of $5.2x10^{-5}$, $1.6x10^{-5}$, $1.8x10^{-5}$, and $5.2x10^{-5}$ cancer fatalities over the assumed MOX fuel fabrication campaign at Hanford, INEL, Pantex, and SRS, respectively.

Under the Preferred Alternative, the use of existing LWRs is being pursed for the disposition of surplus plutonium through the use of MOX fuel in place of UO_2. An important question is whether the use of MOX fuel changes the safety envelope of UO_2 fueled reactors documented in Safety Analysis Reports, PRAs, and NUREG-1150 (*Severe Accident Risks: An Assessment for Five U.S. Nuclear Power Plants*). Related reactor safety issues are addressed in a recent report by the National Academy of Sciences (*Management and Disposition of Excess Weapons Plutonium Reactor-Related Options*). The report indicates that the potential influences on safety of the use of MOX fuel in LWRs has been extensively studied in the United States in the 1970s (*Final Generic Environmental Impact Statement on the Use of Recycled Plutonium in Mixed Oxide Fuel in Light Water Cooled Reactors*, NUREG-0002). These influences have also been extensively studied in Europe, Japan and Russia. Regarding effects of MOX on accident probabilities, the National Academy of Sciences report states, "... no important overall adverse impact of MOX use on the accident probabilities of the LWRs involved will occur; if there are adequate reactivity and thermal margins in the fuel, as licensing review should ensure, the main remaining determinants of accident probabilities will involve factors not related to fuel composition and hence unaffected by the use of MOX rather than LEU fuel." Regarding the effects of MOX on accident consequences, the report states, "... it seems unlikely that the switch from uranium-based fuel could worsen the consequences of a postulated (and very improbable) severe accident in a LWR by more than 10 to 20 percent. The influence on the consequences of less severe accidents, which probably dominate the spectrum value of population exposure per reactor-year of operation would be even smaller, because less severe accidents are unlikely to mobilize any significant quantity of plutonium at all."

The incremental effects of utilizing MOX fuel in a commercial reactor in place of UO_2 were derived from a quantitative analysis of several typical severe accident scenarios for MOX and UO_2 using the MACCS computer code and generic population and meteorology data. The analysis only considers highly unlikely severe accidents where sufficient damage would occur to cause the release of Pu or uranium. The risks of severe accidents were found to be in the range of plus 8 to minus 7 percent, compared to UO_2 fuel, depending on the accident release scenario. The incremental risk of cancer fatalities to a generic offsite population located within 80 km (50 mi) of the severe accident release point would range from $-2.0x10^{-4}$ to $3.0x10^{-5}$ per year for the accident release scenarios analyzed.[18] These preliminary results would be re-examined for licensing purposes and subsequent NEPA review. More detailed safety analyses would be performed using both up-to-date calculations of radionuclide inventories for different fuel compositions and irradiation histories, and population-exposure models for sensitivity changes in those inventories resulting from the use of weapons-grade Pu in the fuel.

[18] Accidents severe enough to cause a release of Pu or HEU involve combinations of events that are highly unlikely. Estimates and analyses presented in Chapter 4 and summarized in Table 2.5-3 indicate a range of latent cancer fatalities of $5.9x10^{3}$ to $7.3x10^{3}$ and risk per year of 0.15 to 0.16.

Natural Phenomena. Under the Preferred Alternative, HEU would continue to be stored at the Y–12 Plant at ORR in existing facilities that would be upgraded. The majority of the HEU would be housed in upgraded facilities currently used for HEU storage. The remaining HEU would be stored in facilities that were formerly used for material processing but are currently being modified and converted into storage areas. Modifications to existing buildings would make the facilities suitable for long-term storage and consist primarily of those upgrades required to meet natural phenomena requirements (including earthquakes and tornadoes) as documented in *Natural Phenomena Upgrade of the Downsized/Consolidated Oak Ridge Uranium/Lithium Plant Facilities* (Y/EN-5080, 1994). The Y–12 storage buildings would be upgraded to meet the performance goal for a moderate hazard facility of Performance Category 3 in DOE Order 5480.28, *Natural Phenomena Hazards Mitigation*. In a Performance Category 3 facility, radioactive or toxic materials are present in significant quantities. Design considerations for this category are to limit facility damage so that hazardous materials can be controlled and confined, occupants can be protected, and functions of the facility can continue without interruption. A performance goal for Performance Category 3 is a hazard exceedance frequency of 1.0×10^{-4} per year (DOE Order 5480.28). Meeting this performance goal would reduce the expected risk for the design basis accidents analyzed in the Y–12 EA (for example, Building 9212) by approximately 80 percent, resulting in a latent cancer fatality risk of 5.1×10^{-7} to the MEI and 5.7×10^{-8} to a noninvolved worker, and potential latent cancer fatalities of 7.4×10^{-6} for the 80-km (50-mi) offsite population.

At SRS, F-Canyon facilities could be used for the immobilization of surplus Pu using the can-in-canister variant under the Preferred Alternative. The earthquake accident analysis in the IMNM EIS determined that the F-Canyon facilities are structurally sound. Since that time, DOE has prepared a *Supplemental Analysis of Seismic Activity on F-Canyon* (August 1996). Based on the evaluation, an earthquake that could occur about once every 8,000 years could cause a level of structural damage to F-Canyon similar to the level of damage attributed to the earthquake considered in the IMNM EIS. Thus, the capability of F-Canyon to survive an earthquake more severe than that evaluated in the EIS, in combination with the fact that the likelihood of this level of damage was less than assumed in the EIS (1 per 8,000 years compared to 1 per 5,000 years), indicates that F-Canyon is seismically safe, or safer, than indicated in the IMNM EIS.

Waste Management

There is no spent nuclear fuel or HLW associated with construction or operation of Preferred Alternative facilities, but the ceramic immobilization facility would generate as its product output a stabilized ceramic form spiked with cesium radionuclides. (For immobilization using vitrification, a stable glass form of Pu and HLW would be generated.) Storage of this immobilized product would be provided until disposal in a geologic repository pursuant to the NWPA.[19] Each of the facilities under the Preferred Alternative have as part of their conceptual design waste management facilities that would treat and package all waste generated into forms that would enable long-term storage and/or disposal in accordance with the regulatory requirements of *Resource Conservation and Recovery Act* (RCRA), and other applicable statutes. Under the Preferred Alternative, the waste management infrastructure of the individual facilities would be integrated into a single waste management infrastructure to include maximum use of existing and planned site waste management facilities. Depending in part on decisions in the waste-type specific RODs for the Waste Management PEIS, wastes could be treated, and (depending on the type of waste) disposed of, onsite or at regionalized or centralized DOE sites. The treatment level and potential disposal of TRU and mixed TRU waste at the Waste Isolation Pilot Plant (WIPP) will depend on decisions in the ROD for the *Supplemental Environmental Impact Statement for the Waste Isolation Pilot Plant Disposal Phase*. For the purposes of analyses only, this PEIS assumes that transuranic (TRU) and TRU mixed waste would be treated onsite to the current planning-basis Waste Isolation Pilot Plant (WIPP) Waste

[19] Pursuant to the *Nuclear Waste Policy Act*, DOE is currently characterizing the Yucca Mountain Site as a potential repository for spent nuclear fuel and HLW. Legislative clarification, or a determination by the Nuclear Regulatory Commission that the immobilized Pu should be isolated as HLW, may be required before the material could be placed in Yucca Mountain should DOE and the President recommend, and Congress approve, its operation. No radionuclides that are RCRA wastes would be used for immobilization so the immobilized product would be consistent with the repository's waste acceptance criteria.

Acceptance Criteria, and shipped to WIPP for disposal. This PEIS also assumes that hazardous waste, low-level waste (LLW), and mixed LLW would be treated and disposed of in accordance with current site practice.

Construction and operation of the proposed facilities would affect existing waste management activities at each of the sites analyzed, increasing the generation of TRU, low-level, mixed, hazardous, and nonhazardous wastes. Wastes generated during construction would consist of wastewater and hazardous and solid nonhazardous wastes. Wastewater and solid nonhazardous wastes would be disposed of as part of the construction project by the contractor, and the hazardous wastes would be treated onsite or shipped offsite, to a commercial RCRA-permitted treatment facility. After treatment, the waste would be disposed of off-site in a commercial RCRA-permitted disposal facility. No radioactive or hazardous soil contamination is expected to be generated during construction. However, if any were generated, it would be managed in accordance with site practice and all applicable Federal and State regulations.

Hanford Site. Under the Preferred Alternative approximately 78.2 m^3 (20,660 gal) of liquid and 750 m^3 (981 yd^3) of solid TRU waste would require treatment, and packaging to meet the current planning-basis WIPP Waste Acceptance Criteria or an alternate treatment level. An estimated 200 m^3 (262 yd^3) of solid mixed TRU waste would be managed and treated as necessary in accordance with the Hanford Tri-Party Agreement to meet the WIPP Waste Acceptance Criteria or an alternate treatment level. Depending on decisions made in the ROD for the *Supplemental Environmental Impact Statement for the Waste Isolation Pilot Plant Disposal Phase*, 109 additional truck shipments per year or, if applicable, 54 regular train shipments per year, or 18 dedicated train shipments per year would be required to transport the TRU and mixed TRU waste to WIPP.

Approximately 70.4 m^3 (18,590 gal) of liquid and 2,010 m^3 (2,630 yd^3) of solid LLW would require treatment, processing, and packaging to meet the waste acceptance criteria of the 200-Area LLW Burial Grounds. After treatment and volume reduction, 2,010 m^3 (2,630 yd^3) of solid LLW would require disposal. Assuming a land usage of factor of 3,400 m^3/ha (1,800 yd^3/acre), this would require 0.6 ha/yr (1.5 acres/yr) of LLW disposal area. The ultimate disposal of LLW will be in accordance with the ROD for the Waste Management PEIS.

Roughly 1.2 m^3 (320 gal) of liquid and 231 m^3 (302 yd^3) of solid mixed LLW would be treated and disposed of in accordance with the Hanford Tri-Party Agreement. The 46 m^3 (12,150 gal) of liquid and 184 m^3 (241 yd^3) of solid hazardous wastes would be collected, treated on- or off-site, and shipped in Department of Transportation (DOT)-approved containers to an offsite commercial RCRA-permitted treatment facility. After treatment, the waste would be disposed of off-site in commercial RCRA-permitted disposal facilities.

Approximately 177,000 m^3 (46.8 million gal) of liquid nonhazardous sanitary and industrial wastewater and 170,000 m^3 (45.0 million gal) of steam plant and cooling blowdown and estimated stormwater runoff would require treatment in accordance with site practice. Depending on actual site location, expansion of existing or construction of new sanitary, utility, and process wastewater treatment facilities may be required. The 3,240 m^3 (4,240 yd^3) of solid nonhazardous wastes that is not recycled or salvageable would be shipped to the City of Richland landfill per current site practice.

Idaho National Engineering Laboratory. Under the Preferred Alternative approximately 373 m^3 (488 yd^3) of solid TRU waste would require treatment and packaging to meet the current planning-basis WIPP Waste Acceptance Criteria or an alternate treatment level. An estimated 8 m^3 (11 yd^3) of solid mixed TRU waste would be managed and treated as necessary in accordance with the INEL Site Treatment Plan to meet the current planning-basis WIPP Waste Acceptance Criteria or an alternate treatment level. Depending on decisions made in the ROD for the *Supplemental Environmental Impact Statement for the Waste Isolation Pilot Plant Disposal Phase*, 44 additional truck shipments per year or, if applicable, 22 regular train shipments per year, or 7 dedicated train shipments per year would be required to transport the TRU and mixed TRU waste to WIPP.

Approximately 8 m^3 (2,100 gal) of liquid and 255 m^3 (333 yd^3) of solid LLW would require treatment, processing, and packaging to meet the waste acceptance criteria of the Radioactive Waste Management

Complex (RWMC). Assuming a land usage of factor of 6,200 m^3/ha (3,300 yd^3/acre), the disposal of LLW would require 0.04 ha/yr (0.1 acres/yr) of LLW disposal area. The ultimate disposal of LLW will be in accordance with the ROD for the Waste Management PEIS.

Roughly 1.1 m^3 (290 gal) of liquid and 40 m^3 (52 yd^3) of solid mixed LLW would be treated and disposed of in accordance with the INEL Site Treatment Plan. The 6 m^3 (1,500 gal) of liquid and 154 m^3 (201 yd^3) of solid hazardous wastes would be collected, treated on- or off-site, and shipped in DOT-approved containers to an offsite commercial RCRA-permitted treatment facility. After treatment, the waste would be disposed of off-site in commercial RCRA-permitted disposal facilities.

Approximately 129,000 m^3 (34.0 million gal) of liquid nonhazardous sanitary, industrial, and other process wastewater would require treatment in accordance with site practice. Depending on actual site location, expansion of existing or construction of new sanitary, utility, and process wastewater treatment facilities may be required. The 253 m^3 (331 yd^3) of solid nonhazardous wastes that is not recycled or salvageable would be shipped to the onsite landfill per current site practice.

Pantex Plant. Under the Preferred Alternative approximately 374 m^3 (489 yd^3) of solid TRU waste would require treatment and packaging to meet the current planning-basis WIPP Waste Acceptance Criteria or an alternate treatment level. An estimated 8 m^3 (11 yd^3) of solid mixed TRU waste would be managed and treated as necessary in accordance with the *Pantex Plant Federal Facility Compliance Act Site Treatment Plan/Compliance Plan* to meet the WIPP Waste Acceptance Criteria or an alternate treatment level. Depending on decisions made in the ROD for the *Supplemental Environmental Impact Statement for the Waste Isolation Pilot Plant Disposal Phase*, 44 additional truck shipments per year or, if applicable, 22 regular train shipments per year, or 7 dedicated train shipments per year would be required to transport the TRU and mixed TRU waste to WIPP.

Approximately 8 m^3 (2,100 gal) of liquid and 392 m^3 (513 yd^3) of solid LLW would require treatment, processing, and packaging to meet the waste acceptance criteria of the NTS Area 5 Radioactive Waste Management Site Waste Acceptance Criteria. After treatment and volume reduction, 324 m^3 (424 yd^3) of solid LLW would require disposal. Assuming a land usage of factor of 6,000 m^3/ha (3,200 yd^3/acre), the disposal of LLW would require 0.05 ha/yr (0.13 acres/yr) of LLW disposal area at NTS. Assuming 16.6 m^3 (21.7 yd^3) of LLW per shipment, 20 additional LLW shipments per year from Pantex to NTS would be required. The ultimate disposal of LLW will be in accordance with the ROD for the Waste Management PEIS.

Roughly 1.3 m^3 (350 gal) of liquid and 48 m^3 (63 yd^3) of solid mixed LLW would be treated and disposed of in accordance with the *Pantex Plant Federal Facility Compliance Act Site Treatment Plan/Compliance Plan*. The 7 m^3 (1,760 gal) of liquid and 155 m^3 (203 yd^3) of solid hazardous wastes would be collected, treated on- or off-site, and shipped in DOT-approved containers to an offsite commercial RCRA-permitted treatment facility. After treatment, the waste would be disposed of off-site in commercial RCRA-permitted disposal facilities.

Approximately 141,000 m^3 (37.2 million gal) of liquid nonhazardous sanitary, industrial, and other process wastewater would require treatment in accordance with site practice. Depending on site location, expansion of existing or construction of new utility and process wastewater treatment facilities may be required. The existing sanitary wastewater treatment system has adequate excess capacity to treat the additional quantity of sanitary wastewater. The 391 m^3 (511 yd^3) of solid nonhazardous wastes that is not recycled or salvageable would be shipped to the City of Amarillo landfill per current site practice.

Savannah River Site. Under the Preferred Alternative approximately 78.2 m^3 (20,660 gal) of liquid and 750 m^3 (981 yd^3) of solid TRU waste would require treatment and packaging to meet the current planning-basis WIPP Waste Acceptance Criteria or an alternate treatment level. An estimated 200 m^3 (262 yd^3) of solid mixed TRU waste would be managed and treated as necessary in accordance with the SRS Treatment Plan to meet the

current planning-basis WIPP Waste Acceptance Criteria or an alternate treatment level. Depending on decisions made in the ROD for the *Supplemental Environmental Impact Statement for the Waste Isolation Pilot Plant Disposal Phase*, 109 additional truck shipments per year or, if applicable, 54 regular train shipments per year, or 18 dedicated train shipments per year would be required to transport the TRU and mixed TRU waste to WIPP.

Approximately 70.4 m^3 (18,600 gal) of liquid and 2,010 m^3 (2,630 yd^3) of solid LLW would require treatment, processing, and packaging to meet the waste acceptance criteria of the SRS E-Area Low-Level Radioactive Disposal Facility. After treatment and volume reduction, 2,010 m^3 (2,630 yd^3) of solid LLW would require disposal. Assuming a land usage of factor of 8,600 m^3/ha (4,600 yd^3/acre), this would require 0.2 ha/yr (0.5 acres/yr) of LLW disposal area. The ultimate disposal of LLW will be in accordance with the ROD for the Waste Management PEIS.

Roughly 1.2 m^3 (311 gal) of liquid and 231 m^3 (302 yd^3) of solid mixed LLW would be treated and disposed of in accordance with the SRS Site Treatment Plan. The 46 m^3 (12,070 gal) of liquid and 184 m^3 (241 yd^3) of solid hazardous wastes would be collected, treated on- or off-site, and shipped in DOT-approved containers to an offsite commercial RCRA-permitted treatment facility. After treatment, the waste would be disposed of off-site in commercial RCRA-permitted disposal facilities.

Approximately 179,000 m^3 (47.3 million gal) of liquid nonhazardous sanitary and industrial wastewater and 170,000 m^3 (45 million gal) of steam plant and cooling blowdown and estimated stormwater runoff would require treatment in accordance with site practice. Depending on actual site location, expansion of existing or construction of new utility and process wastewater treatment facilities may be required. The centralized sanitary wastewater treatment system is adequate to treat the sanitary portion. The 3,250 m^3 (4,250 yd^3) of solid nonhazardous wastes that is not recycled or salvageable would be shipped to an offsite landfill per current site practice.

Intersite Transportation

The estimated health effects from transportation of radiological materials for the Preferred Alternative actions at Hanford, INEL, Pantex, and SRS for the life of the project range from 0.193 fatalities for Pantex to 1.87 fatalities for SRS.

In addition to the activities at the DOE sites, there would be transportation of the MOX fuel from the DOE fuel fabrication site to existing LWRs. The location of the LWRs and the destination of the MOX fuel could be either the eastern or western United States. For 4,000 km (2,486 mi) there could be an additional 3.61 potential fatalities. The 3.61 potential fatalities assumes that 100 percent of the surplus Pu would be used in commercial reactors. For analysis purposes, approximately 70 percent of the surplus Pu would be used in commercial reactors under the Preferred Alternative, therefore potential fatalities could be lower.

Environmental Justice

There would be no high and adverse health or environmental impacts to any population around the sites, including low-income and minority populations, from normal operation of the Preferred Alternative actions. The alternatives would confer socioeconomic benefits to each site where storage or disposition activities would occur (except RFETS), and therefore would not lead to any environmental justice concerns.

For environmental justice impacts to occur, there must be high and adverse human health or environmental impacts that disproportionately affect minority populations or low-income populations. The public health and safety analysis shows that air emissions and hazardous chemical and radiological releases from normal operations for all storage and disposition alternatives would be within regulatory limits and that no latent cancer fatalities would result.